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Management Services in Government

November 1979 Volume 34 Number 4

Contents

Page

181 The Professional Ethic of the Administrator
R. W. L. Wilding, CB

187 Does O and M need a Different Perspective?
A. Phillips

192 The Effectiveness of Suggestions Schemes
F. L. Killeen

197 Good Housekeeping in Typing and Secretarial Services
E. L. Smith

201 Coping with Change in the Public Sector
Management Processes Panel of the Chartered Institute of Public Finance and Accountancy

206 Simulation in the Sizing of Computer Systems
P. M. Stephenson

217 Computer Training—Professional Level

218 Three Time Estimates
R. C. Riddett

221 Management Bookshelf
Mrs B. M. Howard

225 New CSD Publications

227 Letter to the Editor

228 Computer Installations for Government Departments

229 Index for 1979

The Professional Ethic of the Administrator

R. W. L. WILDING, CB, Civil Service Department

Richard Wilding is the Deputy Secretary in charge of the Management Group in the Civil Service Department. This article is based on an address he gave to a seminar organized by the Civil Service College and the Public Administration Committee of the Joint University Council for Social and Public Administration on 6th April 1979. In it he expresses some personal views—*Editor.*

As an administrator in the United Kingdom Civil Service, I have no professional ethic. At the same time, I belong to a service composed of people whose conduct, whether you approve of it or not, is so consistent as to suggest a quite remarkable uniformity of approach to how they should behave. The situation is a curious one, even paradoxical; it deserves attention.

When I say that I have no professional ethic, I do not mean only or even mainly that nobody has actually written me a code. There is a set of rules in the Establishment Officers' Guide which is a partial code of sorts. I mean, rather, that I am not a member of a profession. American civil servants may belong to a profession; I am not sure. British civil servants (regarded, that is to say, as civil servants and not as architects, doctors or lawyers who happen to work in the Civil Service) do not. That is a statement about the British constitution. I have no professional ethic; what I do have is a set of constitutional duties.

What I mean by that is that there is no room within the United Kingdom's constitutional system for a self-regulating profession of administration with a philosophy of behaviour or a set of values of its own. We are the servants of the Government of the day and have no constitutional existence except in that capacity. While we are selected by the Civil Service Commission, we are appointed by Ministers and owe them our whole duty so long as they remain in office. We cannot appeal over their heads to the Crown, for the Crown acts only upon the advice of its Ministers. We cannot appeal over their heads to the written constitution, for there isn't one. We cannot appeal over their heads to some separate concept of the people's will, for they are the people's elected representatives; or to the public interest, for the public interest is what they were elected to decide. It follows from this that there can be no independent authority on which to base a licence to do anything contrary to what our Ministers instruct. Our professional ethic is their command.

Constraints on Ministerial power

There are, however—and it is just as well that there are—limits to the authority of the Minister to issue commands. Three such limits are relevant. The first is the law. Civil servants are obliged to keep the law and cannot be absolved from that obligation by any command of their Ministers. The second is the accountability of Ministers to Parliament; Ministerial commands cannot be arbitrary so long as they have to answer to Parliament for everything that is done in their name. The third is a limit internal to Government—the fact that collective responsibility resides in the Cabinet; this imposes limits on the power of a Minister to instruct his civil servants to do something contrary to a collective Cabinet decision.

These constitutional limits are important and their influence is, I think, pervasive. The effect of the law is, of course, by no means confined to protecting the civil servant from having to carry out unlawful instructions; it has a direct bearing upon the actions he initiates himself. It is first and foremost an essential safeguard against the most obvious dangers to honest administration—bribery and the abuse of public office for private gain. But it is equally important as a safeguard against a more insidious and therefore a greater danger—that of oppressing the citizen or depriving him of his rights in pursuit of the greater public good. A recent case illustrates the point—the case dealt with by the Parliamentary Commissioner for Administration under the title 'A War Pensions Injustice Remedied'. You will remember the point it raised, and I do not want to go into the case in detail. But the point for my present purpose is that while I have no direct knowledge of the case, I should judge it highly probable that the officials concerned did what they did for what they judged to be a valid public purpose, namely, the saving of what might have been a heavy administrative cost. There are plenty of areas of administration where the law is an essential corrective to the natural tendency to behave in this sort of way.

Effects of Constraints

Ministerial accountability to Parliament affects the ethics of administration in a rather different way. In effect, it exposes the actions of the Minister and his servants to the scrutiny of MPs and thus to measurement against *their* standards of what constitutes decent conduct and reasonable administration. This safeguard is often criticized as inadequate. But it has been quite considerably strengthened by the creation of the Parliamentary Commissioner, and I believe that it too has a pretty powerful effect. It is worth adding to it the special responsibilities placed upon the Accounting Officer, which is relevant to our consideration of ethics in two respects. The first is that the activities of the Exchequer and Audit Department, backed by the probing of the Public Accounts Committee, constitutes a very strong protection indeed for financial probity. The second is that in this field, and I think in

this field only, an official, namely the Accounting Officer, has a recognized personal accountability of his own, and the protection of being able to insist upon a written instruction from his Minister which is then communicated to Parliament if he is over-ruled on a matter of impropriety or irregularity in the spending of public money.

The influence of collective Ministerial responsibility, on the other hand, is an internal one. Its interest for the ethics of the administrator lies mainly in the influence of the collective principle upon the way in which officials behave towards each other. It is because all major decisions are taken collectively that officials of different departments consider it good ethical practice, as well as more efficient, to share information; to tell each other the truth (up to a point); and to warn each other of what is coming forward in good time. This practice is quite frequently misunderstood and gives rise to such expressions as 'the Mafia of Permanent Secretaries'. Individualistic Ministers sometimes chafe at it; you will be familiar with the relevant extract in the Crossman diaries. But what it is in reality is a necessary consequence of collective Cabinet responsibility.

The framework for moral decisions

This then, as I see it, is the constitutional framework within which civil servants have to take their moral decisions and which has a strong effect on the way they take them. Its main features are the total constitutional responsibility and therefore the enormous authority of the Minister, but tempered by collective responsibility, subject to the law, and policed by Parliamentary scrutiny. Two of its characteristics deserve comment. The first is that it is, in theory and in principle, a very democratic system. The authority to determine how civil servants shall behave is totally vested in the elected representatives of the people; there is no basis on which the civil servant, the appointed official, can seek to impose his own values on the course of Government action.

The second characteristic, closely linked to the first, is that it is a very tight and rather closed system. There is equally no room in it for the character who is known in American literature on the subject as the whistle-blower. In Britain the aspiring whistle-blower is blocked. And the reason why he is blocked is not fundamentally, and never has been, the Official Secrets Act—that doubtful prop of the British Constitution. It is the fact that if he blows his whistle, the player against whom he is registering a foul is his fully responsible Minister. He is therefore committing a politically hostile act, and *ipso facto* doing something inconsistent with his Civil Service status. The whistle-blower in this country must blow his whistle in the privacy of the Minister's room. If that is ineffective, he should resign his post before he blows it publicly.

A constitutional framework, however, is only a framework; an ethic is more than that. What, if anything, animates these dry bones with any breath of life? I referred at the beginning to the fact that most of

us behave in a very similar way. Is that simply the product of the constitutional context? Or is something else at work? If so, is it something to be protected and encouraged, or changed, or replaced?

The Administrator's Code

There is a process known nowadays to academics as 'socialization'—a process of instilling acceptable codes of behaviour. It is certainly at work in the Civil Service. Its main application, however, as I have observed it, is more to how things are done than to what things are done. We are not notably 'socialized' into a commitment to particular Government policies; after all, they change. The twig is, however, bent, and bent quite strongly, towards the accepted ways of going about things. There is a language you may use, and a language you may not use, for the purpose of telling a fellow official that he does not know his arse from his elbow. You must consult your colleague before you make a proposal affecting his field of responsibility. You should acknowledge, not pilfer, other people's ideas. You should not tell lies to other departments, though it is by no means always incumbent upon you to tell them the whole truth. And if you are, on your Minister's instructions, doing something which your opposite number in another department, on his Minister's instructions, is resolutely opposing, you will both do well to conduct yourselves with the thought in mind that next week, next year and under different Ministers one day, you will have to do business together again and may well need each other's help. The relatively few people who regularly disobey precepts like these are conspicuous. Sometimes they are so brilliantly able that they rise to high rank and make life difficult for an ever-widening circle of other civil servants in the process. More often, they do not.

The Civil Servant's Ideal

But this is still the shadow, not the substance; the manner, not the driving force. Can we talk, in this context, of moral intensity, of commitment? Only with caution. Insufferable Talleyrand was, as so often, insufferably right with his '*surtout, pas de zèle*'. There is, at the end of the day, a contradiction between a strong moral commitment to any given policy and the requirement to be the wholly loyal and effective servant of the Minister of the next administration who reverses it. In this respect, the Civil Service necessarily breeds Laodiceans. We must, I think, distinguish energy from commitment. It is absolutely necessary to pursue today's policy with energy; it is almost equally necessary, in order to survive, to withhold from it the last ounce of commitment.

At the same time, however, I believe that it *is* possible to care, and care passionately, to throw in the last ounce of commitment, for the idea of service itself; and to invest that commitment in our particular institution, the Civil Service, with all its manifest imperfections. When Lord Armstrong was head of the Civil Service, he was asked on a television programme what he looked to to guide his conduct. He said he

supposed that it was his own ideal of what a civil servant should be. I think he was saying the same thing in different words as I am, and I suspect that if one could inspect the ideal of the civil servant as it is in his mind, in mine and in the minds of many of my colleagues, one would find it very much the same. It may seem odd to say this when we have recently seen a large-scale one-day strike of the Civil Service in which for the first time the Association of First Division Civil Servants encouraged its members to join. But I believe that ideal is still powerful and is what breathes life into the conduct of many more civil servants at all levels than society as a whole is nowadays apt to believe.

What are the main ingredients of that ideal? I think that they include:

the belief that the good government of this country is a matter of high importance and the opportunity to contribute to it a privilege; the belief that it therefore demands the best you can give it, in all matters and all the time;

a professional pride in making sure, so far as you can, that the objectives that Ministers set themselves are objectives that can in practice be achieved, and that the Government then sets about the job in such a way that they are achieved in fact;

the courage to give unwelcome advice;

the resilience and humour to accept repeated disappointment and frustration without becoming cynical;

the willingness to listen to other people, to learn from your own mistakes and to work in collaboration rather than competition;

two spoonfuls each of honesty, tenacity and obedience; and one spoonful of humility.

Season with common sense, a dash of political judgement and a consuming interest in at least one totally different subject and simmer gently for 40 years.

Will the ideal last?

There is a touch of *Pilgrim's Progress* about that, and Kipling's *If* and (oh dear, yes, I suppose so) Plato's *Republic*. But if you consider the recipe, the most obvious thing about it is that it is, in almost all its particulars, what the constitutional framework itself is apt to promote and even, one might also say, to demand. It raises, however, a question—one of the two o'clock in the morning kind. I have tried to describe something—perhaps an ethos rather than an ethic—which I believe many of us share. On the whole I think it has the merit of being consistent with the facts of life in government in this country, and on the whole I do not think it has served the country badly. The question is whether it will do for the future: whether the facts will continue to

support it and whether it will remain serviceable. It depends on the survival of a number of other things, and some of them begin to look shaky. For example:

a general consensus about what actually constitutes decent behaviour and fair administration;
a continuing acceptance of collective Cabinet responsibility;
a continuing acceptance of Ministerial accountability;
a continuing acceptance that a commitment to service as such is possible, has value and is what the country needs in its civil servants rather than a commitment to the particular policies and beliefs of the political party in office;
some degree at least of readiness to trust civil servants, and other functionaries as well, to observe the generally accepted rules of decent behaviour.

If these things disappear, we shall have a different sort of Civil Service with a different sort of ethos.

Whether they will disappear or survive seems to me at the present time very difficult to predict. If the framework I have described slides apart, I suspect we shall inevitably be in for an era of legal and legalistic attempts to find substitutes for the ethos in statutes, codes, restrictions, investigations and surveillance. I do not myself believe that such a régime is likely to produce as many devoted people doing as much good work as the present one.

We are sorry that distribution of this journal is being delayed because of industrial difficulties in Her Majesty's Stationery Office.

Does O and M Need a Different Perspective?

A. PHILLIPS, Civil Service Department

Tony Phillips is a Principal in Functions and Programmes Division 2, Civil Service Department. In the article that follows he expresses some personal views. —*Editor.*

> Whose side are you on?
> There are no sides. We're all in this together.
> The Goon Show

Introduction

In the November 1978 edition of the journal John Barker suggested that we need to change our approach so that we are no longer seen as producers of panacea-like packages and rigid techniques, but instead recognize that implementation of our recommendations will be successful only if people willingly accept the changes proposed. He then went on to illustrate the differing roles and relationships that would have to be adopted in order to accomplish successfully this shift in emphasis.*

The implication behind these proposals appears to be that many of our assignments are undertaken on the unwritten assumption that we are experts; that we conduct our fact-finding, generate ideas and still present these ideas to management and staff in the form of a report which they are left to implement. In contrast the new approach encourages us to abandon the 'expert' role and to acknowledge that the real experts are the management and staff concerned. Accordingly it is they who identify the problems and search for solutions. This generates a greater degree of commitment to the changes—an ownership of the proposals—leading in time to improved implementation. (No more reports accepted in principle and filed in cupboards!)

Contrasted thus we are faced with a black-and-white picture which does not properly represent what we are actually doing. Many of us already adopt roles and relationships which encourage staff to produce ideas (I freely admit that all my best recommendations have been culled from the staff of the organizations in which I have been working) and to implement them as the assignment proceeds without waiting for the final report. Nevertheless, as I move round departments I find that the majority of reviews and assignments are still finalized by a

* 'The O and M-er—A Different Perspective?' by J. Barker. *MSIG*, Volume 33, Number 4, November 1978.

report presented to management for implementation; that few management services units are involved in the process of change and that as a result far too many recommendations never see the light of day. This suggests that the underlying assumption in Mr. Barker's article is correct: that some shift is necessary. What we might challenge individually is the degree of movement.

However, that is not the main purpose of this article. Having accepted that we do need to revise our approach (however little that re-orientation might be) I wondered why this has become important now. Why was the traditional 'give them a report containing our recommendations' approach considered appropriate from the early days of O and M and why is it increasingly questioned today? In what follows I have set out the reasons as I see them but I (and the Editor) would be pleased to hear other perhaps contrary views.

Change

The question I have asked myself is, what is different? The difference as I see it is in the rate and type of changes that are taking place around us now and in the future. These are dealt with under the following headings:

social culture and climate
technology
Civil Service recruits
Staff Side attitudes
Civil Service culture
the role of Management Services.

Social culture and climate

Few would argue with the view that the rate of technological and consequently sociological change in human society is rapid and seems to be accelerating. Whole books have been devoted to the subject and the effect it is having or is likely to have on peoples' lives, e.g. Alan Toffler's *Future Shock*. (Now turned into a musical!) Even a casual reading of history confirms this view; for example, the agricultural society lasted many centuries, the industrial society, if we accept that it is in decline, not more than two centuries. How long will the next information-based society leading, perhaps, to the leisure-based society last?

Human life styles change within a decade—we all lead lives different in pace, material wealth, social behaviour, dress, etc., from those of our parents. We have different aspirations and different standards. Educational systems foster an approach more questioning and less respectful of authority. Conformity to general standards is no longer *de rigueur*. Life is easier for minorities (though conformity may be expected within the minority group). The growth in the strength of the unions has shifted the balances of power within society. The Welfare State has removed employee dependence for money/survival. A career no longer means service with one employer and so on.

Technology

Many of these social changes have been fuelled by changes in technology. Radio and television have brought into our homes details of events, habits, customs from all parts of the world against which to set and question our own. Changes in transport from the car to the supersonic airliner have made travel easier.

Similar technological changes have affected the way we do our jobs. From quill pens and ledgers, through typewriters, photocopiers and desk-top calculators to computers, microfilm, pocket calculators, etc. All have changed the way we work (but not, it seems, the amount of work!). More changes are on the way—word processors changing the way we hold and manipulate written material, micro-computers more powerful than the previous generation of main frame computers.

Much of this recent development stems from the soon-to-be-ubiquitous chip. A great deal of conjecture has been made about this, mainly by newspapers looking for an easy headline. Nevertheless all the indications are that, even though it may not throw nations out of work, it will have a considerable impact on the office of the future. Some idea of the foreshadowed changes can be seen by the even smaller pocket calculators, the television and self-play games, Tomorrow's World demonstration of a completely automatic unmanned pop station. Within the Service we in Management Services, the Central Computer Agency and others are beginning to talk about the automatic communicating office.

Civil Service recruits

Against this background it is not surprising that the sort of people coming into the Service are different, with views and aspirations at variance to our own. In this changed world, the Service is not the attractive, secure, status-bearing employer it once was. Recruitment is, therefore, that much more difficult. Those we do get have, in recent years, tended to be less well qualified educationally at the lower levels in contrast to a higher proportion of degree entrants at EO level. The brighter, academically-able candidates are less willing to regard the Service as their final employer, to work in dull routine jobs, to accept the need to perform tasks without question; they look to the employer to provide jobs that are intrinsically satisfying. We have a more aware but more fluid work force.

Staff Side attitudes

Whereas the relationship between the Staff and Official Sides used to be of gentlemen reaching agreements by discussion and compromise, the increasing union strengths outside the Service, particularly following the unionization of white-collar workers, the growing use of professional career union leaders in Civil Service unions, the attempts to change management styles through the introduction of MbO, job satisfaction, etc., which Staff Sides see as a threat to their traditional roles, have caused them to become more political and more militant.

They have become less acquiescent, more demanding, more involved and have to be carried along if changes are to be achieved.

Civil Service culture

Within the Civil Service as a whole there have grown up certain norms and traditions. For example, the relationships between the central departments—the Treasury and CSD—and the rest. The concepts of 'establishment', pay scales and pay relativities; Whitleyism; hierarchical structures; progression by steps within classes, etc. The relationships between departments and Parliament; between departments and the public are another example.

Within departments too there are separate cultures and traditions. Those who have moved from one to another will know of the differences in titles, nomenclature, procedures and practices. The more rigid autocracy of the older, traditional departments; the differing personnel policies—over transfers (advertise or not), or promotions (boards or not); the differing methods of dealing with trade unions (participation or arm's length); the differing methods of dealing with or communicating with the public (compare public information leaflets from revenue departments with those from spending departments).

These are concepts and traditions which many of us, once imbued, are reluctant to give up. Changes are sometimes forced on departments by Parliament—mergers and divisions have become commonplace—but resistance is strong, e.g. it is easy to find people who hark back to 'the good old days of the Ministry of Transport' or who say 'I am a National Insurance man', and it is not too difficult to find examples of mergers which do not (and may never) lead to total integration.

Other changes, such as the use of job appraisal reviews or career development interviews, have been recommended but not universally adopted, despite the generally welcome acceptance both by staff and trade unions.

Yet more changes will be necessary if the Service is to adopt and adapt to the technological, environmental changes and the changes in the people it employs with their more challenging outlook that I have already mentioned.

The role of Management Services

Where does Management Services fit in all this? We all recognize that Management Services is about convincing people of the need to change and we are familiar with the difficulties inherent in that. There appear to me to be two fundamental causes for these difficulties:

(1) At the individual level a common initial resistance; a desire to remain as we are with the things and people with which we are most familiar and comfortable. Change may appear to pose a threat to established roles and positions within the organization or may induce an anxiety that acquired experience or skills may prove inadequate or inappropriate in the new situation. There may be

economic status as well as psychological implications in this perceived threat. Even in our relatively secure employment it is important to recognize that such fears exist, establish the reasons for them and tackle them in an appropriate way.

(2) At the organizational level, the aggregate effect of the individual attitudes and, because of the complexity of modern departments, the difficulty of conceiving even the smallest organization as a total system. It is thus extremely difficult for any one individual or internal group first to see the problem, work out the needs of the situation and then convince other parts of the organization to change.

This natural reluctance to change is in direct contrast to the world that I have postulated earlier, leading to a continuing (and, perhaps, escalating) conflict between:

(*a*) The individual, developed socially, environmentally, educationally in particular ways, working in an organization created to serve a set purpose, which has also developed in a particular way (with established norms and practices); both the individual and the organization likely to have become more set and rigid with age.

(*b*) A society changing at an accelerating rate, fuelled by technological and sociological developments, leading to quite different needs, expectations, skills and desires within a decade.

It is a conflict in which even those in the work situation who see a need to change are handicapped by an inability to stand back and take an objective view, lack of time, often lack of management training, a lack of training in analytical skills and a lack of information. But it is a conflict which has to be resolved and a balance struck. Which is where we came in!

To strike a balance and to speed up the necessary changes, we in Management Services need to do more than we have to involve people (which brings me back to the quotation at the head of this article); we need to adopt the approaches recommended by Mr Barker. In many ways this will make our task that much harder, and it may mean that we have to look more closely at the sort of people we are recruiting into the discipline. Greater emphasis will be placed on communicating and working with other people and we shall have to exhibit greater skills in planning, diagnosis and presentation to ensure that the changes really are adopted, taken on board and owned by those who have to make them.

The Effectiveness of Suggestions Schemes

F. L. KILLEEN, Civil Service Department

Leo Killeen is a Principal in Management Development Division of the Civil Service Department. —*Editor.*

Many large employers run schemes, variously known as staff suggestions schemes, suggestions schemes or simply awards schemes, which, they generally claim, have two main benefits. First, they provide a system within which ideas, many of them profitable to the employer and which otherwise would not see the light of day, can be channelled to a central point having the necessary authority to ensure that they are promptly and impartially investigated and, if put into use, rewarded. Secondly, the very existence of such a scheme has clear benefits in promoting good relations between the employer and his staff, partly because the communications system it provides is direct to headquarters and independent of line management, and partly because it constitutes what might be called a safety valve for the employee who would otherwise feel frustrated.

When suggestions schemes administrators gather together, there is often talk about whether their schemes are really worth while. Many of them are under pressure from management to justify their existence. Claims are sometimes heard which are clearly extravagant, but some schemes at least appear to operate in an atmosphere of genuine accountability. At a workshop held in 1977 under the auspices of the Industrial Society the majority view was that a suggestions scheme was worth while if the cost of running it breaks even with the value of the benefits in money terms *and* management is content that there is in their judgement a sufficient benefit in terms of staff relations.

It may be that someone other than myself could have a shot at putting a value on staff relations benefit. I am certainly not going to attempt it. I should, however, like to suggest a number of reasonably straightforward headings as a framework within which the costing of the direct benefits might be attempted. The main elements of any assessment seem to be:

(*a*) The administration of the scheme.
(*b*) The evaluation of suggestions received.
(*c*) Awards.
(*d*) The benefits derived by the employer.

Each of these headings deserves some amplification.

The cost of administration

Schemes vary very much in size. Some are very simple, and might manage on a part-time clerk, a part-time junior executive and perhaps an occasional meeting of a small committee (usually including nominees of the relevant trade unions). Others require full-time staff, sometimes including investigating officers as well as administrators. The 50 or so separate schemes, all working to the same agreed model, in government departments represent all points between these extremes except that investigation is kept separate from administration. The secretary of a scheme in a government department, around whom the day-to-day work revolves, is usually an Executive Officer or Higher Executive Officer. His chairman, who presides over the joint committee which determines award levels, is usually in the Senior Executive Officer—Assistant Secretary range. The costs, or proportionate costs, of their salaries, accommodation and support, and those of their staff and of their supervisors should clearly be counted as administration costs. Less obvious, but equally real, are the costs of committee meetings. In the Civil Service, award assessments are usually made by committees comprising nominees of management and trade unions. The cost of arranging, servicing and conducting meetings can be considerable, particularly if nominees have to travel or incur subsistence expenditure.

Evaluation costs

By this term I mean the cost of ascertaining the value of the benefits which flow from the implementation of suggestions; in other words, whether they are worth while. This is a much more elusive figure than the cost of administration. A good employer will wish to be fair to his suggesters—otherwise he would not have set up his scheme in the first place. The likely result of even the simple changes proposed by most suggestions can only be seen if they are examined perceptively. Even the most apparently trivial suggestion deserves serious examination by those who would be responsible for putting it into effect. More substantial suggestions obviously need a good deal of careful thought and perhaps some sort of a trial period.

Some suggestions schemes have an investigation staff who work hand in hand with those who administer the scheme. The usual practice in government departments, however, is that the evaluation of suggestions is done by staff in the relevant policy or executive area of the department, although sometimes Management Services or survey staff lend a hand. It is done with varying degrees of sympathy. Much of the work is undoubtedly an additional chore and, as such, of some nuisance value. After all, only a very few suggestions are likely to prove worth while. Yet if suggestions are not evaluated promptly and objectively the scheme as such is threatened and may become a lifeless and expensive formality.

If it is the management's wish that their suggestions scheme should be viewed with approval and should operate smoothly (and otherwise

they should not maintain it) it is essential that, when suggestions arrive on their desks for evaluation, officers should bear in mind that at one end of the chain of which he is part is a colleague who has gone to the trouble of putting forward his idea; and that at the other is his top management who hope to save money if the suggestion proves worth while and at least to retain the suggester's goodwill even if it does not. Both look to him for a fair and expeditious evaluation and therefore he has a duty to give the suggestion appropriate priority and to report on it fairly and adequately. If he does not he will only increase the quite significant cost consumed by this, the most necessary, stage in the procedure.

Awards

The cost of awards* is a matter of fact, unencumbered by abstract considerations. In 1978/79 awards totalling about £26,000 were made to suggesters in Government Departments. The average award was about £16, but 16 awards were of £100 or more. A list of these awards reported to the CSD as having been made during 1978/79 may be of interest and follows this article.

Total costs to the employer

The total costs to the employer of a suggestions scheme are therefore the cost of the staff who administer it, who evaluate suggestions received and who decide what awards should be paid; and the cost of the awards themselves.

The value of benefits

The answer to the question, what does the employer get in exchange for these costs, which in the aggregate can be quite high, needs in any essentially administrative organization to be considered in unquantifiable terms as well as in those of hard cash. First, there is a benefit in improved staff relations. Secondly, some would argue that a well-run suggestions scheme is a useful indicator of problem areas such as bottlenecks and poor local management. But quantification of such benefits, if they exist, is clearly too speculative to weigh heavily in the balance except as an adjunct to the staff relations benefit. It is therefore useful to look first at the benefit which can be quantified.

Standing arrangements in government departments require the benefit from suggestions to be quantified wherever possible, and to be certified as having been so quantified by the relevant financial authority where the benefit is significant. As will be seen from the annexed list nearly all the major awards made in government departments are for suggestions which yield quantifiable benefits in money terms. Indeed the size

* Government Departments use an agreed system for assessing awards designed to avoid major anomalies between departments and individuals. The main determinants used are the value of the benefit, the normal duties of the suggester and the originality of the suggestion.

and nature of the benefit (whether quantified in money terms or arrived at as a matter of judgement) has already been identified as one of the main determinants of the amount of award. And it is sometimes overlooked that, generally speaking, the benefit from specific suggestions recurs year after year. Various estimates are heard of the duration of this benefit. In a particularly valuable recent case the specialists thought the benefits would last for at least five years. But few procedures endure in detail in these days for so long. On the whole, a three-year period seems more reasonable.

Unquantifiable benefit

This, by definition, can only be regarded as a bonus. The benefits of many, if not most, of the suggestions received by government departments are not quantifiable in money terms; or would be too expensive so to quantify. Most are in any event trivial in that they effect minor aspects of procedure. But, whether actually or potentially some yield obvious benefit which is clearly of value—though how, for instance, does one quantify the value of an idea which renders the escape of a terrorist from custody less likely, or makes it easier for tanks or submarines to communicate with each other?

Conclusion

It seems reasonable to conclude that both the costs and the benefit of staff suggestions schemes are higher than a first glance would indicate; but that on balance they serve a useful purpose that cannot be achieved otherwise.

Major awards for staff suggestions notified to the Civil Service Department 1978/1979

Department	Grade of suggester	Brief description of suggestion	Award
Ministry of Defence	Lieutenant, RN	New track recording program—for ships' weapons computer	£100 (Interim)
Ministry of Defence	Flight Lieutenant	Simulation to assist training in anti-submarine tracking techniques	£150
Ministry of Defence	Fleet Communications Chief Yeoman (RN)	Training aid for teaching signal procedures	£150
Ministry of Defence	Ordnance Electrical Artificer I	Guide for refitting of submarine telescopic communications masts	£100 (Interim)
Ministry of Defence	PTO 1	Cost savings on radio connectors	£120
Department of the Environment	Foreman Electrician	Boiler fuel economy at District Works Office, Norwich	£100
Department of Industry	PTO	Skimmer to cleanse water surface of the towing tank for testing model ships at the National Marine Institute	£140
Department of Industry	Ass. Chief Photoprinter	Use sorting boxes to collate terminal digit filing order fiche in the Sepia Library, London	£450
Department of Industry	EO	That Excess Rent Allowance calculations should be computerized instead of carried out manually	£275
Inland Revenue	11 Suggesters all HEO level and above	Exclusion of a list of new entrants from the Departments weekly newsletter	£220
Inland Revenue	Valuation Clerk (Higher Grade)	Use by the Valuation Office of cheaper storage covers	£370
Inland Revenue	HEO	Discontinuation of the use of Recorded Delivery Service for the transmission of legal documents submitted for Inland Revenue stamping	£300
Inland Revenue	Senior Inspector	Discontinue Budget Estimate Enquiry form to businesses asking for forecasts of future profits	£100
Ordnance Survey	Draughtsman 3	The use of Rotring Stencils on 1: 10,000 replacement boundary record sheets	£100
HM Stationery Office	Warehouseman Gp 3	Eliminate cutting as a separate operation in the finishing room at Basildon	£100
HM Stationery Office	Technical Officer	Replace hand sewing by machine sewing in an HMSO bindery	£500

A Good Housekeeping Exercise in Typing and Secretarial Services

E. L. SMITH, Civil Service Department

Eric Smith is a Senior Executive Officer in Management Development Division in the Civil Service Department. —*Editor.*

There can be very few people who are not aware of the attention being paid by the unions, the media and employers' organizations to the application of the 'new technology' which, its protagonists claim, will revolutionize our lives. It is generally accepted that in the forefront of the new technology will come word processors and that their effects are going to be felt at an early stage by typists and secretaries.

In the Civil Service we have 80 or more typists already using word processors and applying the new technology. There are, however, some 29,000 other typists and secretaries who are labouring away on electric and manual typewriters who have not yet had an opportunity to try out the benefits of word processors. In the near future there will, therefore, be a need for information on word processing and its application to the Civil Service, and it is intended to publish articles about the trials of stand-alone word processors currently being staged by the Management Services (General) Division of the Civil Service Department (CSD). Meanwhile this article concentrates upon the difficulties faced by the many thousands of typists and secretaries upon whom we depend for so much of our work, and most of whom will for some time to come have to keep going on their old 'workhorses'. It sets out to draw attention to ways in which they can be helped to give of their best.

Typing Resources

In resource terms, typing and secretarial services comprise the equipment associated with typing, e.g. typewriters and dictation equipment, but more importantly the experience and skills of its staff of typists, secretaries and supervisors. Taken together these represent a very valuable asset to the Civil Service. It is one which has substantial running costs and departments should therefore ensure that it works at peak efficiency.

Typewriters and dictating equipment should always be used as fully and efficiently as possible, not least in a time, as now, of financial restraint. HMSO should not be asked to supply additional equipment until existing machines are being used to the full. This can be done by pooling them at, say, divisional level. Too often dictation equipment issued to individuals is to be found gathering dust in drawers and cupboards.

Turning to the human resources, as far as typists are concerned there are two ways to make the best of their skills. The first is simply to encourage their development so that they attain their proficiency awards. The second reflects the old computer adage, 'garbage in, garbage out'. Typists can get through their work more quickly when they are working from good clear source documents, whether in the form of manuscript or dictation. Manuscript drafts sent to typing pools ought therefore to be written clearly even if the author's manual dexterity does not permit them to be written elegantly, and tapes should be dictated precisely and clearly. It is part of the duties of typing superintendents to educate authors by drawing bad input material to their attention, together with work which need not be typed and other faults causing difficulties in the work-flow of a pool which prevent it from giving the best service.

Making the most efficient use of the services of any typing pool depends very largely upon the approach of individual originators of work, few of whom will admit to having any shortcomings. Nevertheless, as a good housekeeping exercise departments might well consider it appropriate to prepare and send round an *aide-memoire* as a reminder of the good and the bad habits associated with sending work for typing.

To type or not to type?

A point which originators of work often overlook is that it can take typists much longer to type amendments compared with manual amendment by the author. Wherever possible authors should consider seriously whether a piece of work containing errors needs to be returned to the typing pool or whether it could not be amended equally effectively in manuscript. There are occasions when work must be sent out completely free of correction but usually a few minor amendments made in manuscript are perfectly satisfactory. Certainly this applies to most internal work. Once it has been read most of the paper generated in the Civil Service spends the rest of its life in a file, if it is retained at all. When typed amendment is essential it should be indicated on a carbon copy and *never* on the top copy.

Perhaps the most effective way authors can contribute to the efficiency of typing pools is by not sending work to be typed at all. This is not to say that they should write everything in manuscript but often all that is called for is a handwritten note or a telephone call. In that case it is important that the telephone is used economically, notably by making the call at a low cost time of the day (i.e. after 1 pm). The

cost of typing a one-page A4 letter is now around the £2 mark, so that using the telephone instead can be very cost effective.

Typing pools

The efficiency of a typing pool depends in no small way on the efforts of its superintendent, and authors can make her job less arduous by thinking seriously about the priority which they ask to be given to work and being realistic in the completion times they stipulate. If there is no hurry for a job the superintendent should be allowed to fit it into the normal working of the pool. If all work received is marked 'Immediate' it all becomes routine and some genuinely immediate work will inevitably go to the back of the queue and be delayed.

In considering the service given by typing pools it is important not to lose sight of the value of out-stationed typing pools. The benefit of these are well known and it is an established fact that work sent to them is cheaper to complete as well as an easement of the burden placed on hard pressed central pools. This is not perhaps the best time to be thinking of establishing new out-stationed pools, but it most certainly is a time when existing pools should be used to the fullest extent. There is benefit in associating pools and individual typists with specific divisions for morale and for familiarization with work.

Personal Secretaries

The final element in the typing service is the secretarial staff and needless to say it is difficult to assess their effectiveness, and even more so to bring about any changes because the service which secretaries give is by definition individual and jealously guarded by them and their 'masters'. There is a body of opinion which considers the present structure inefficient because the skills of which the typist was promoted to secretary are usually not fully utilized. Critics advocate the establishment of 'secretarial groups' staffed by secretaries and clerical staff. Such groups, it is claimed, could take on work from a wider range of senior staff than secretaries do at present, but it is recognized that this would have repercussions in typing pools. However, this is a wider question which brings into play such facets as job satisfaction, pride in work, ambition and which perhaps is best not ventilated here.

The way secretaries are allocated varies from department to department; in some it is on a one-to-one basis while in others one secretary serves a number of senior officers; in some the provision of a secretary is automatic at a specified rank, in others it is based on need. Equally the workload and work mix of secretaries varies from person to person. Often secretaries have to prepare typing which is going to be redrafted several times. Such work is best done on word processors but, generally, each secretary has too small a volume of such typing to warrant the provision of a costly machine. If such staff are to benefit from the new technology a fresh and radical approach to their problems may be needed. But that is a question for tomorrow and in this article the suggestions are aimed at making the best use of what there is today.

The purpose of personal secretaries is to provide a prompt service which includes typing to senior staff whose time is costly. If secretaries are able to provide a satisfactory service and yet, as is often claimed, are not fully occupied, should they not be able to take on extra work? At the very least should they not take divisional typing *for* as well as *from* their masters? Where secretaries are kept more than fully occupied the question has to be asked whether they are doing the right sort of work. There are, for example, times when secretaries are asked to type out long reports very quickly. Unless there are over-riding reasons for not doing so it may be more efficient to send such work to a typing pool where it could be allocated to several typists so that the whole job could by typed in a much shorter time. The question of quality of source documents is, of course, no less important for staff who have secretaries than for those who use the services of a typing pool.

Conclusion

These, then, are just a few of the things which if followed by everyone using the services of secretaries or typing pools would ensure that the Civil Service gets the maximum benefit from its typing service; and which will ensure that when word processors become more generally available the typing and secretarial service will be well placed to make the best use of the benefits they offer. There are a number of factors, not least of which are the financial constraints, which are likely to slow down the introduction of word processors into the Civil Service for the next year or so and this means that departments have a breathing space in which to get their 'typing houses' in order. Anyone involved with the running or organization of typing pools should have as a must on their reading list the Management Services handbook *Typing Services*, published by CSD.* This handbook is intended as a summary of the experience of Management Services in examining the problems of typing services and also an indication of current lines of thought. Superintendents, for example, will find among the appendices a specimen form for returning bad copy to an originator.

*Copies obtainable by Government Departments from HMSO, and by other organizations (price 50p post free) from the Central Management Library, Room 1/1, Old Admiralty Building, Whitehall, London WS1A 2AZ.

Coping with Change in the Public Sector

This article by the Management Processess Panel of the Chartered Institute of Public Finance and Accountancy was first published in the September 1979 issue of *Public Finance and Accountancy* and is reproduced by permission of the Chartered Institute. —*Editor.*

The need for public sector organizations to change their patterns of expenditure to reflect variations in demand is by no means a novel requirement as reflected in comments contained in the Plowden Report published in 1959.

Some novel elements have emerged in recent times: for example, the substantial changes in demand, especially arising from demographic factors such as the reduction in school population and rising numbers of elderly, and their relative importance in financial terms; the diminution, or elimination, of 'growth' in overall public spending following a decline in gross domestic product (GDP) (i.e. excluding inflation), thereby emphasizing the importance of switching resources; the impact of successive energy 'crises' and the effects on costs, prices and demand; and more recently the emphasis on reducing the size of the public sector by reducing taxation and shifting resources into the private sector.

Whilst in theory the very existence of multi-service local authorities should provide the ideal basis for resolving the problems of switching resources to meet such changes, in practice there is evidence to suggest that obstacles are preventing it happening on anything like the scale required to match the demographic developments. In the field of nationalized industries and public corporations organized on a commercial basis, the intervention of directions and controls by Government and its agencies have also created obstacles to changes in levels of provision and methods of operation.

Forces promoting change

The forces promoting change in spending patterns can be classified according to the source of the pressures and the methods and techniques used.

Sources of pressure include:

- the general state of the world economy and its effect on Britain via the balance of payments;
- energy crises arising from the shortfall in supply of Middle East oil; and
- technological changes, e.g. microcomputers.

Techniques

The medium by which pressures are exerted vary but the source of them in the public sector will be the Government and its agencies, or in local authorities the elected members. Techniques of influence used by the Government include approval of investment programmes, direct financial assistance (either generally related to volume of services or specifically for certain forms of spending) and financial targets for return on capital. Within general policies established by the Government, management may use techniques of appraisal which promote change, e.g. pricing policies related to long-term marginal costs, test discount rates, payback periods and productivity targets.

Against this background it is important for public sector managers to analyse the causes of resistance to changes in public expenditure patterns, to identify forces which promote change and to consider solutions to the considerable problems facing the public sector in the 1980s.

Causes of resistance to change

The causes of resistance to changes in spending patterns can be classified into various categories; namely, factors which are external, or internal, to the organization, or those which apply to politically directed organizations such as local authorities as distinct from nationalized industries. Some problems affecting the capacity of organizations to change are actual barriers (*legal* or *physical* constraints), whilst others are due to the way the problem is perceived (*time scale* or *uncertainty*).

General factors external to the organization creating legal or physical constraints include those described below.

During periods of incremental real growth in public expenditure (as experienced in the 1960s and the early 1970s) public sector bodies can often reflect the changing needs of their clients without imposing serious constraints upon on-going services. During periods of no growth or decline, however, any response to newly-perceived needs must be at the expense of reductions in volume or standards of service in other areas of provision. At a time, therefore, of increased need for effective and efficient management of services to all client groups there is generated a trenchant defence of existing practices at the expense of responsiveness to external change.

Standards and volume of services tend to become an accepted fact of life and public expectation is geared to existing levels of service with the result that attempts to modify service provision produce vocal public reaction which is sometimes out of proportion to the sums of money involved, e.g. the abolition of school milk for the over-sevens. Pressure groups can act as forces both resisting and encouraging changes in public spending patterns, but locally some of the more tenacious tend to be those defending existing rights and benefits, be it tangible services or more abstract matters such as environmental standards.

Statutory requirements for minimum standards of service, or more

general enactments such as employment and health and safety legislation, impose constraints upon public bodies in particular, inhibiting flexibility in service provision or charges leviable. Also the practice of setting targets for future development of services via circulars and ministerial statements establishes enhanced minimum standards and raises expectations which inhibit the transfer of resources away from a service claiming to be below such standards, e.g. in-service training.

Physical constraints also exist which hamper changes to public expenditure. Resources are quantified in financial terms but in practice are represented by tangible objects which cannot be transformed into alternative uses with anything like the facility which applies to mere alteration of financial sums. Thus commitments built into services in the way of staff employed, buildings, vehicles and equipment, and even systems of operation, are not so readily switched into alternative uses.

Internal rules such as financial regulations governing the exercise of virement can inhibit flexibility in the direction of spending and restrict the ability of managers to respond to changing needs and circumstances.

Finally, the emphasis of training is upon basic instruction for a specific job rather than retraining to meet changing demands which therefore restricts adjustment of skills and jobs.

Time-scale and uncertainty

As was suggested earlier, some of the barriers to changing expenditure patterns are due to the manner in which the problem is perceived.

Recognition of the long-term 'structural' nature of changes in demand is essential if wasteful exercises in resource-switching are to be avoided. For example, it may well prove wasteful to scrap 'surplus' assets, such as schools and experienced teachers, if an upturn in the birthrate produced a shortage within four or five years. Arguments that trends indicating a need for a switch in resources are therefore of a temporary nature only will also prove an obstacle to change.

Trade union involvement in staffing policies and productivity proposals in particular require considerable care and effort on the part of management to achieve redirection of services and spending and in some circumstances would be an obstacle to change. Another consideration is that public accountability for policies, and actions, of the organization and spending of public money tends to induce a more cautious attitude towards change and risk-taking. Lastly, the effect of public enquiries into possible developments can entail an organization in long-term public commitments which may be difficult to abandon when circumstances change.

Local authorities—special factors

Factors which particularly affect local authorities in the context of time-scale and uncertainty include the matching (or mis-matching) of the political persuasion of central government and individual local

authorities, which can markedly affect responsiveness of local spending plans to central encouragement or direction. Also, in directly elected organizations such as local authorities, there is a possibility that the optimization of short-term political returns (related to election timescales) will prevail even to the detriment of accepted long-term objectives.

Within directly elected committee based organizations like local authorities the success of a chairman is reflected more in the extent to which his service objectives prevail than they are in the extent to which corporate objectives prevail. It follows that in periods of no growth or decline in spending, programme committees will be extremely reluctant to free resources made available through, say, a reduction in their client numbers for use centrally for application towards highest priority needs. The importance of individual political success may thereby preclude an adequate response to changing client needs across the whole range of services. These same comments apply with equal, or more, force to ministers whose political success may therefore rest upon their ability to persuade or direct local authorities to sponsor 'their' service irrespective of the wider perspective.

Objections to loss of 'empires' and professional standing can explain unwillingness on the part of chief officers and their staffs to see resources switched away from their service. In fairness it must be recognized that improvement in services is a natural (and laudable) ambition and therefore to fight for a better service for a reducing group of clients is quite understandable. However, it should equally be recognized that the 'price' may well be a reduction in service for a growing group of clients.

The lack of price consciousness in local authority services can result in unusually wide-ranging standards of provision, as evidenced by the situation inherited by the regional water authorities in 1974 in the case of sewerage and sewage treatment and water supply. The statutory requirement for regional water authorities to levy charges on customers which cover the cost of services provided means that the cost to consumers of water services are no longer hidden in a general rate demand nor are they subsidized from central funds. The initial results of this 'customer reaction' has been a substantial reduction in the capital investment programme.

Nationalized industries—special factors

Other factors particularly affect nationalized industries. Approval by Government of the level of investment, including certain specific projects and asset replacement policy, is one; compliance with Government financial targets and approval to major policy changes is a second; and intervention by the Government and its agencies, e.g. the (now defunct) Price Commission, in the management of the industry, such as price increases, pay awards and deferment of revenue-producing investment, thereby distorting costs and demand, constitutes a third.

Possible solutions

Solutions can be directed either at lessening the resistance to change or at increasing the capacity for change. Both of these courses of action can be supported by the development of 'constraint' analysis to determine real restrictions on courses of action and identify areas of opportunity for changing spending patterns over various periods of time.

Increasing the *capacity* for change can be assisted by strong central policy direction by policy type committees and departments, including finance and manpower, providing a forum for discussion of objectives and decisions on resource allocation. Longer term forecasting of needs and resources, with a variety of options to enable a more general view to be taken of the purpose and direction of the organization over a time scale within which there is more flexibility, is another possibility.

Resource allocation systems that place an emphasis on policy and budget review, e.g. PPBS or zero budgeting, as distinct from incremental variations, can help to increase the capacity for change, as can greater use of price mechanism to equate demand and supply, e.g. by relating price to long run marginal cost. This might be extended to a number of areas not presently regulated by 'price', such as school meals and transport or library books.

Three further options which suggest themselves are a higher degree of self financing of capital investment, especially in nationalized industries, coupled with a better use of investment appraisal techniques; construction of asset profiles for use in the longer term assessment of plans for disposal of surplus assets, changes of use, or provision of temporary buildings to meet short term peaks; and revised management arrangements to link supervision of growing and contracting services by the regrouping of functions under senior managers, so that each has a more balanced range of responsibilities covering services both receiving and losing resources. Lessening the *resistance* to change can be assisted by reducing the areas of activity governed by mandatory requirements and widening the area of discretion in spending and the provision of services, thereby enabling a more fundamental reassessment of priorities by the organization itself in place of central government prescription: by confining Government involvement to strategic areas such as approval of long-term policies and the setting of performance targets for measuring progress towards policy aims: and by more flexibility in manpower policies to cover early retirement and special redundancy terms. Greater freedom is needed also in transfers between related disciplines by means of retraining and improved inducements for such transfers and help in geographical relocation.

Simulation in the Sizing of Computer Systems

P. M. STEPHENSON, Civil Service College

Peter Stephenson is a Principal Scientific Officer on the teaching staff of the Civil Service College. —*Editor.*

Definitions

Before embarking upon a discussion of this topic it would be wise to establish what is meant by 'simulation' and 'sizing' in the context of computer system study. Below are three definitions of *simulation* taken from two dictionaries and an encyclopedia, arranged in chronological order of publication date:

(1) 'the action or practice of simulating, with intent to deceive; false pretence, deceitful profession; unconscious imitation; a false assumption or display, a surface resemblance or imitation of something.' (*Shorter Oxford English Dictionary*, 1967)

(2) 'feigning; mimicry; making working replicas or representations of machines for demonstrating or for analysis of problems.' (*Chambers Twentieth Century Dictionary*, 1972)

(3) 'the representation of certain features of the behaviour of a physical or abstract system by the behaviour of another system. . . . The purpose of simulation is usually to make experimental measurements or predict behaviour (of a system)'. (*Encyclopedia of Computer Science*, 1976)

It is interesting to note the strong implication of deception in the earlier, non-technical definitions of simulation. Perhaps this is why, even today, it is still treated with some suspicion as a problem solving technique! Simulation is, of course, one of the many techniques employed in the area of operational research (OR), and while we are on the subject of definitions it strikes me that one of the best yet given of OR is the following:

'The art of giving bad answers to problems to which otherwise worse answers are given' (T. L. Saaty, 1959).

Sizing has acquired a meaning for data processing practitioners which is only tenuously linked with any dictionary definition. Perhaps one of the most satisfactory descriptions of it is the following:

'sizing is concerned with the evaluation of the resources and facilities needed to perform a data processing task, to achieve a specified service at a cost commensurate with the user's requirements' (*Penguin Dictionary of Computers*, 1977).

A sizing study would normally result in the following end product:

(1) An assessment of the work load to be processed by the system.

(2) A statement of the hardware resources needed for the processing.

(3) A summary of the software resources needed.

(4) A statement of manpower resources required to develop and maintain the system.

(5) An estimate of expected throughput and resource utilization.

(6) An assessment of the spare capacity within the system.

(7) An estimate of the expected reliability of the system.

There are many techniques available for carrying out sizing and usually several will be used to allow for cross-checking of results.

Among these techniques are:

use of *benchmarks*, i.e. running representative workloads on a variety of computers in order to obtain factual information on their performance;

use of simple mathematical equations to calculate the *timing* of data transfers, program loops, etc.;

use of *queueing theory* to study the effects of variability in arrival rates and service times on the build-up of traffic in a system;

use of *simulation*, the subject of this article.

Simulation is a useful technique in that it allows for iteration easily and relatively inexpensively so that the consequences of possible variations in workload and resources can readily be evaluated. In particular, it helps in evaluating items (5) and (6) above, to assist in making the right choices at (2) and (3).

Before the simulation of any system can be carried out, it is necessary to construct a *model* of that system. This is usually a physical or abstract representation of the real system built in such a way as to facilitate its study and analysis. Some features or attributes present in the real situation have to be discarded in the model and the skill of the modeller lies in knowing what should be included and what should be left out.

Classification of models

Models may be classified as in *Figure 1*.

Examples of each of the four sub-classes are:

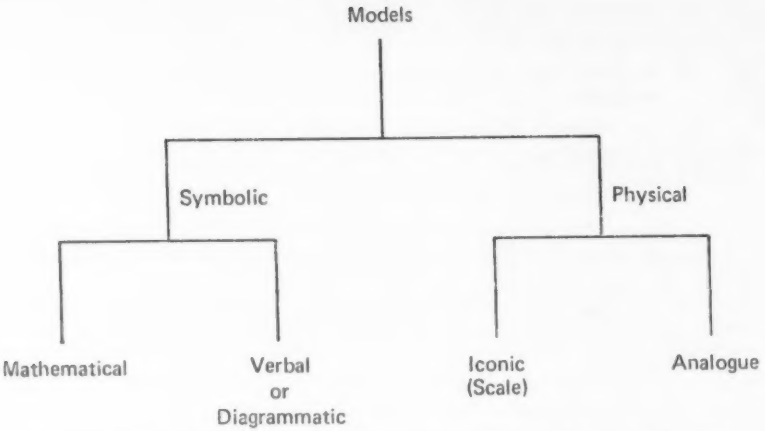
(1) a set of mathematical equations used to represent the behaviour of the economy;

(2) a diagram representing the flow of people, aircraft, vehicles, goods, etc., through an airport, showing the location of queues, service points and other salient features of the systems;

(3) a scale model of an aircraft in a wind tunnel;

(4) an electrical analogue representation of a car suspension system.

Fig. 1



A model of a digital computer system would most closely resemble that in example (2) above, with, for example, queues of people waiting for terminals, and queues of transactions waiting for service by the Central Processing Unit (CPU) or waiting for the various input and output (I/O) devices, including perhaps communications lines, to be available.

Models may be further classified as either **deterministic** or **stochastic.** In a *deterministic* system, the outcome of any activity in the system may be exactly predicted from a knowledge of the inputs to it, particularly if the behaviour of the system is governed, for example, by the laws of physics or chemistry.

In a *stochastic* system some events occur randomly and usually only the probability of an event occurring is known. Thus the overall system behaviour can only be predicted within probabilistic limits. Stochastic systems are rather more common than deterministic ones and a computer system such as that described above would generally be modelled as stochastic, although parts of its operation are deterministic in nature.

A further distinction that may be made is between **continuous** and **discrete** systems. In a *continuous* system activities progress in a smooth manner, e.g. the flight of an aircraft, where the airflow has a continuous effect on the aeroplane, or the compression and relaxation of springs in a car suspension system. Simulation may be applied to continuous systems by means of an analogue computer; indeed the whole concept of analogue computers is based on the idea of simulation by forming an electronic analogue of the real system. In a *discrete* system, events occur discontinuously and variables usually take on integer values, e.g. the operation of a post office where customers arrive at discrete

intervals and are counted in whole numbers. Again, a digital computer system would fall into this category.

Simulation of discrete systems can be achieved by using digital methods (with or without the aid of computers) and we will now look in more detail at how this is done, including a simple worked example related to a computer system.

Discrete event or digital simulation

Discrete systems typically involve (*a*) the occurrence of events at intervals (e.g. arrival of customers at a bank); (*b*) some queueing time; and (*c*) some servicing time. Events are usually stochastic in nature and because of this element of chance the methods used to simulate such systems are often known as 'Monte Carlo' methods. The basis of such methods is that random numbers are generated and then used to sample the known (or theoretical) probability distributions for the events which are to be simulated, thus providing sets of values of arrival times, service times, etc., which represent the behaviour of the working system. The worked example which follows should make this clear, but first a word about the generation of *random numbers*.

For small simulations this can be achieved by the use of something like a roulette wheel, by shaking dice, or by using tables of random numbers such as those found in many statistical textbooks. However, with the increasing use of digital computers for carrying out discrete simulation, the tendency is for the random numbers themselves to be computer generated. They are then known as 'pseudo-random' numbers, because from a given starting number, or 'seed', the same sequence of random numbers will always be produced. However, in most other respects they do exhibit the properties expected of true random numbers, e.g. no readily detectable patterns and equal probability of occurrence of all the numbers in the range selected.

Worked example

For our example we will take a very simple model with transactions queueing for service by a computer CPU. For the moment we will not concern ourselves with where the transactions came from or where they go to after they leave the CPU. This can be represented diagrammatically as shown in *Figure 2*.

Suppose the pattern of arrivals is known (either from observation or from theoretical considerations) to be as in Table 1.

This means that the gap between arrivals is zero on 14 per cent of occasions, is 5 ms or less on 35 per cent of occasions, 10 ms or less on 60 per cent of occasions, 15 ms or less on 81 per cent of occasions and is never greater than 20 ms.

Suppose also that the pattern of CPU service times is as in Table 2.

This means that service in the CPU takes 5 ms or less on 34 per cent of occasions, and so on up to 25 ms as the maximum possible service time.

Fig. 2

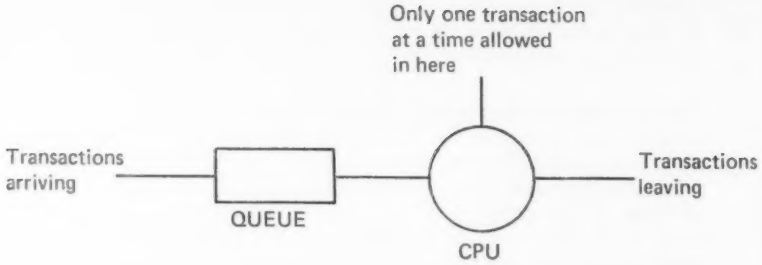


Table 1

Interval between arrivals (ms)*	Occurrence (%)
0	14
5 or less	35
10 or less	60
15 or less	81
20 or less	100

Table 2

Service time (ms)*	Occurrence (%)
5 or less	34
10 or less	60
15 or less	76
20 or less	90
25 or less	100

Table 3. Arrivals

Random Nos.	Times (ms)*
1– 14	0
15– 35	5
36– 60	10
61– 81	15
82–100	20

Table 4. Service times

Random Nos.	Times (ms)*
1– 34	5
35– 60	10
61– 76	15
77– 90	20
91–100	25

* ms = millisecond = $\frac{1}{1000}$ second.

In order to simulate the behaviour of, say, the first 12 transactions, we will need two sets of 12 random numbers, one set for the arrivals and one for the service times. We will use random numbers in the range 1–100 for searching the two tables of percentages above.

Suppose the following are our two sets of random numbers:

For the arrivals:	09	66	82	39	93	55	87	20	07	45	71	23
For service time:	66	94	15	03	74	39	23	85	41	17	77	58

The random numbers are then used to search the inter-arrival and service timetables as in Tables 3 and 4.

Thus a random number of 36 would yield an inter-arrival time of 10 ms, and a random number of 63 would yield a service time of 15 ms.

A table (Table 5) can now be built up simulating the behaviour of the first 12 transactions. It is customary to start the simulation from a zero time base.

Notes on the table:

(1) Columns 3 and 6 are derived using the random numbers in columns 2 and 5 respectively.

(2) Column 4 is derived by accumulating the values in column 3.

Using the table, the following information can be derived:

(*a*) Average waiting time for a transaction ($85 \div 12 = 7.1$ ms).

(*b*) Total idle time of the CPU (20 ms).

(*c*) Maximum queue length at any one time during the period of the simulation (two transactions).

Such information is clearly of value in sizing a computer system, since the average waiting time, for example, contributes to the overall response time for the system and the maximum queue length determines the amount of memory to be allocated for holding queues.

What has been calculated here, of course, is only one possible sequence of behaviour of the system and in practice one would also wish to simulate many more transactions than the first 12, partly because there is always a 'settling down' period at the beginning of a simulation before a pattern of behaviour begins to emerge. It is usual nowadays, therefore, to carry out simulations using a computer (one of the desk-top variety would be ideal for a small application such as the example above). This has the advantage not only of reducing the manual effort involved but also facilitating re-runs with varying parameters of the problem, so that by trial and error an optimum design can be achieved.

More complex models

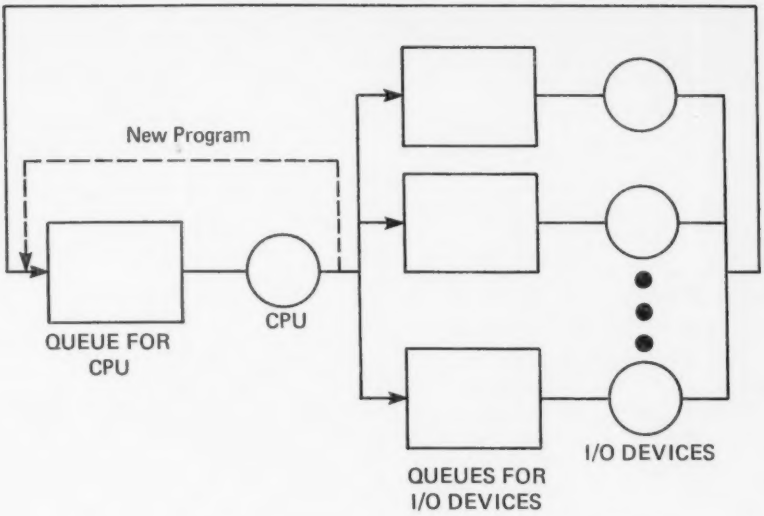
The worked example shown above represents, of course, only a very small part of a complete computer system. Most models used for the analysis of multiprogramming computer systems are based on the so-called central server type as shown in *Figure 3*.

Table 5

1	2	3	4	5	6	7	8	9	10	11
Transaction number	Random number	Time interval	Time of arrival	Random number	Service time	Start service	End service	Wait time*	Idle time	Maximum queue*
1	09	0	0	66	15	0	15	0	0	0
2	66	15	15	94	25	15	40	0	0	1
3	82	20	35	15	5	40	45	5	0	0
4	39	10	45	03	5	45	50	0	0	0
5	93	20	65	74	15	65	80	0	15	1
6	55	10	75	39	10	80	90	5	0	0
7	87	20	95	23	5	95	100	0	5	0
8	20	5	100	85	20	100	120	0	0	2
9	07	0	100	41	10	120	130	20	0	2
10	45	10	110	17	5	130	135	20	0	?
11	71	15	125	77	20	135	155	10	0	?
12	23	5	130	58	10	155	165	25	0	?
Totals								85	20	

* Wait time and queue length respectively have been calculated excluding service time and the transaction being serviced. Also it is not possible to determine the queue length after 130 ms of simulated time, because it is not known how many more transactions will arrive while numbers 10, 11 and 12 are being serviced.

Fig. 3



The behaviour of programs (or transactions) in such a model is characterized by an alternating sequence of CPU and I/O processing requests, with each request preceded by a potential queueing delay. The number of transactions circulating through the model corresponds to the level of multiprogramming in the system being modelled.

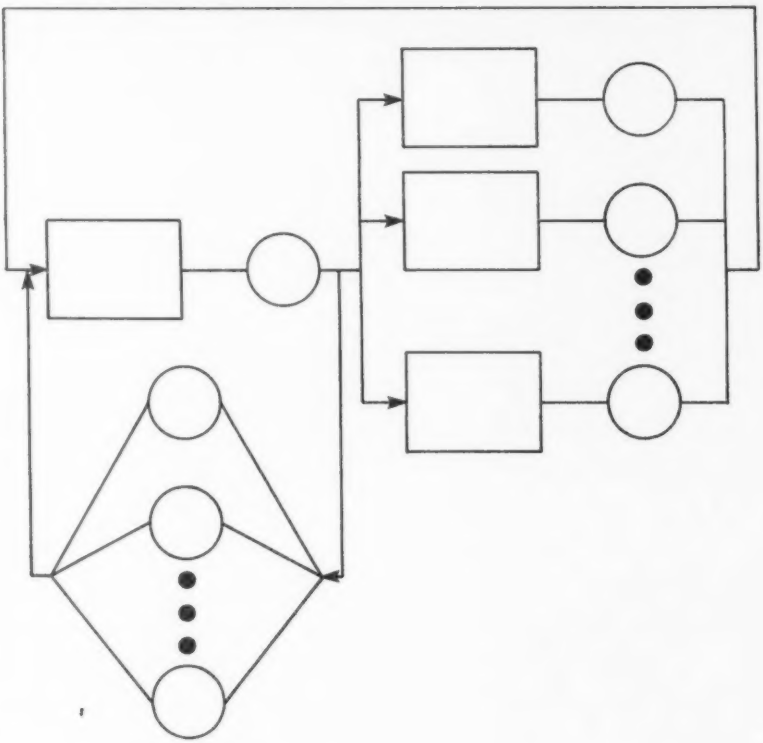
In the case of a *batch processing system* with a continuous supply of work, it can be assumed that a new program is loaded into main memory whenever an active program terminates. This is represented by the 'new program' loop at the CPU in the above diagram.

Alternatively, for an *interactive system* with on-line terminals the model may be constructed as shown in *Figure 4*. For simplicity any queues associated with the terminals and communications lines have not been shown, although, of course, these could also be modelled.

The essential feature of this type of simulation is that the progress of the individual transactions is tracked from server to server in time. Hence it is necessary to know the pattern of behaviour of each program (e.g. the ratio of CPU to I/O requests) and the distribution of service times for each service point in the system. Often these values can only be estimated, or derived theoretically, and this should be borne in mind when assessing the results of the simulation.

Also, the more complex the model is, the more computing power will be required to perform the simulation. It may even approach the power of the system being simulated!

Fig. 4



The kind of variable factors that could be investigated by simulation using models such as these are:

CPU speed
number, size and speed of disc drives
utilization of the CPU and other devices
how much space to allow for queues (of transactions and/or people)
line speeds
network configurations
response times
number of terminals
level of multiprogramming or multi-threading.

This is not to say that simulation is the answer to all sizing problems; it is advisable to use it in conjunction with the more conventional analytic approaches such as benchmarks and timing calculations. In any method the results are only as good as the data on which they are based and, of course, they can only be an approximation to 'real life'.

Nevertheless sizing, however it is carried out, is an essential prerequisite to any study that aims to produce results which are at least within the right order of magnitude.

Before leaving the subject of simulation it is appropriate to have a brief look at some of the computer aids available in this area and then finally to review in a general way the advantages of using simulation, not only in computer projects but for problem solving generally.

Use of special languages and packages for simulation

It will be clear that to write one's own computer program in a conventional language for the more complex models, which may include networks of computers, would be time consuming to say the least. Fortunately there are a number of modelling and simulation languages and packages available which greatly facilitate the process. Some examples of simulation languages are:

GPSS. Probably the most widely used in the world. One version of it, GESIMTEL, has been used successfully at the Civil Service College. It requires no knowledge of any other computer language.
HOCUS. Developed at Imperial College, London, and now commercially available. Written in FORTRAN but requires little knowledge of computers by users.
SIMON. A set of ALGOL sub-routines. Requires knowledge of ALGOL by the user.
CSL. A FORTRAN type language. Requires knowledge of FORTRAN by the user.
SIMSCRIPT. Of USA origin. Requires minimal knowledge of other languages.
SIMULA. ALGOL-based. Requires knowledge of ALGOL by the user.

In most cases the simulation language is used to describe the system to be simulated and the work to be performed; the language processor then forms a computer program in one of the standard languages ready to run. The end-user does not therefore need to know in detail how the simulation works nor to be involved in the sort of calculations shown earlier in this article. What is needed, however, is an awareness of the general principles of constructing models similar to those illustrated.

There is also a commercially available package specially written for the analysis of current or proposed computer systems. This is known as *Systems and Computer Evaluation and Review Technique* (SCERT) and

full details are available from the Technical Services Division of the Central Computer Agency (CCA). Briefly the package consists of six sub-systems which maintain and use 'data bases' of information about the models to be simulated and the hardware and software capabilities of the computing equipment to be employed. The latter information is 'built-in' to the package for certain well-known makes of computer, so that the user does not need to know too much about how the computer works. The results are available in the form of raw data which can then be assessed by the user's own routines and as ready-made reports in up to 23 standard formats.

Advantages of simulation

These may be summarized as follows:

(1) Although it is possible to visualize the behaviour of individual components of a system, an overall view is difficult to achieve without the aid of modelling due to interactions between the components of the system and their often random behaviour.

(2) Approximations based on averages, or on intuition, can be very misleading and result in wrong management decisions.

(3) Observing a model's behaviour provides a good insight into causes of bottlenecks and other problem areas.

(4) The impact of proposed modifications can be evaluated prior to actual implementation.

(5) Modelling permits the consideration of several alternatives, especially when these involve significant departures from current practice.

(6) When modelling precedes implementation, the risk of unanticipated troubles is greatly reduced.

(7) Simulation may be virtually the only approach in new situations where it is impossible to gain practical experience.

(8) Conclusions and recommendations from a model study are often easier to explain, and easier to obtain co-operation and approval for, than expert opinions and approximations alone.

(9) By varying the parameters of the model it is possible to use an iterative approach to system design.

Conclusion

Although simulation may be a time-consuming and expensive process (because of its trial and error nature and the need to incorporate a large amount of detail in the model) it is an effective tool in the hands of experienced people. Where expertise is not locally available, the CCA is able to give advice and support to Government users who need to assess computer systems. For other problem areas departmental OR groups, or the Civil Service Department's OR group, can advise and perhaps help with simulation or other modelling needs. Computer manufacturers and software houses can also be helpful, particularly where proprietary languages and packages are concerned, and the CCA can give advice to Government Departments in the choice of these.

Computer Training—Professional Level

Departments are already aware of the general pattern of training which it is desirable to give to government computer staff.

An appropriate target for the intermediate level of professional training is the Part 1 examination of the British Computer Society (BCS) in which there are optional papers suitable for either systems analysts or programmers. The Directorate of Systems Training at the Civil Service College has pioneered part-time sandwich-type courses which aim to give sound training in the foundations of computing and prepare students for the examinations. In addition to running these courses in-house, the College has arranged their adoption by some Polytechnics: in 1979/80 136 places are available, 50 at the College and 86 at Polytechnics—North Staffs, Brighton and Kingston upon Thames.

At the most advanced professional level, i.e. equivalent to an honours degree, the BCS Part 2 examination can be taken. This year, for the first time, sandwich-type courses have been arranged at North Staffs and in addition a few civil servants will be attending the full-time MSc course (which gives BCS Part 2 exemption) at the Royal Military College of Science, Shrivenham.

The results of the BCS Part 1 examinations sat by College students in April 1979 were once again very good:

Papers passed	No.	Pass rate
Internal	140	90%
Polytechnics (North Staffs and Thames)	56	88%
	196	89%

(A total of 110 students each took two papers.)

In addition, five students gained exemption from the BCS Part 2 examination following full-time diploma courses at London School of Economics and North Staffs Polytechnic.

Details of the entire 1979/80 Systems Training Programme, covering both Computers and Management Services, are given in a brochure obtainable from Secretariat, Civil Service College, Sunningdale Park, Ascot, Berks SL5 0QE. Tel. Ascot (0990) 23444 ext. 233, or Whitehall CBX 2092-233.

Three Time Estimates

R. C. RIDDETT, Civil Service Department

In the article 'The Road to Cardiff', which was published in the February edition this year, there was a reference to the 'three times formula'. We received one or two inquiries about this reference, following which Roy Riddett, a Principal Scientific Officer in CSD's Management Services (Operational Research) Division, kindly offered the following short article on this method of estimating processing time in the absence of detailed statistical data. —*Editor.*

Introduction

Estimates of the average number of items dealt with in a period or the average time to process an item often form the basis of a calculation of the man-hours involved and hence the number of staff required. Such a calculation is usually quite simple in a well-established system with plentiful performance data. It is often far more difficult where the task is being performed for the first time or modified in some way; where this is the case there are probably no relevant data on which to base estimates and the estimate must be made on the basis of the experience and intuition of the senior staff concerned.

Estimation without performance data

In the absence of performance data an inquiry about the expected processing rate is unlikely to result in a good approximation to the required average. This is because the average is a mathematical expression which has no physical distinguishing features. In certain rather special circumstances a reasonable estimate may be made for reasons that are examined later, but in general if any figure at all is forthcoming it will not be a good estimate of the average processing rate. Instead it is necessary to ask for information which will have a physical significance, thus helping the client to give realistic answers, and then to convert these answers into a good estimate of the average which is required.

Physical characteristics of the processing time

Figure 1 is a representation of a typical distribution of processing time. The vertical axis, F, measures the frequency of occurrence of a particular time, so there are no items which can be processed in less than A time units or more than B time units. The largest frequency is at L time units; this time occurs more often than any other individual time, but not necessarily more than all others. E is the average or expected time and does not occupy a unique or special position on the curve so it is not physically identifiable.

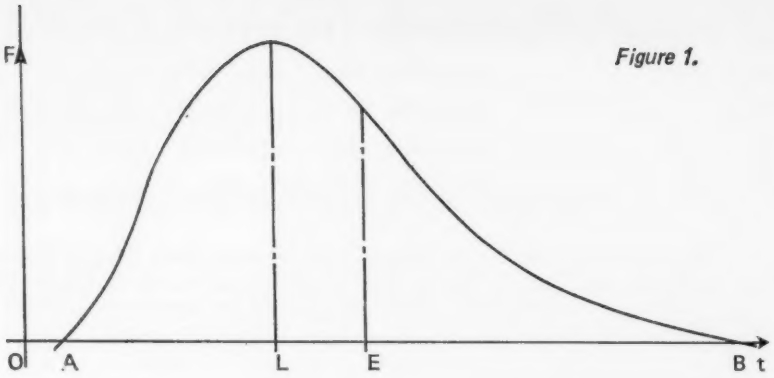


Figure 1.

There are common terms for A, B and L. A is called the optimistic time, B the pessimistic time and L the most likely time. Note that the distribution is bounded on the lower side of L by zero but is theoretically unbounded on the upper side. This has the effect of making the distribution non-symmetrical; the spread of times is much wider above L than below L. The greater the overall spread and in particular the spread above L the greater is the difference between L and E so it can be seen that for symmetrical distributions L and E coincide but not for any other.

Relationship between A, L, B and E

Relationships between the above parameters can be developed for any theoretical distribution. The one chosen by mathematicians in practice is the *beta* distribution because it has an extremely simple mathematical form while being a reasonable approximation. We do not need to go into the mathematics here; suffice it to say that an expression can be derived of the form:

$$E = \frac{A + 4L + B}{6}$$

Use of the estimator

Armed with such an estimator the client may be asked to supply values for A, B and L. With his special knowledge of the job it should be possible for him to provide reasonable values. Quite often A = O will be an acceptable approximation and practical considerations put an effective upper limit on B. Values of A and B usually come quite readily to the lips of clients, in the case of B often associated with some tale of near calamity. Once the values have been supplied E is easy to compute.

As an example, assume that a manager has estimated that the processing times for applications for a new grant are:

pessimistic time	100 hours
optimistic time	4 hours
most likely time	20 hours

$$\text{Then } E = \frac{4 + (4 \times 20) + 100}{6} = \frac{184}{6} \text{ or } 30\tfrac{2}{3} \text{ hours}$$

Note that this is half as much again as the most likely time so if a single estimate had been solicited and this had turned out to be the most likely time the workload would have been underestimated by 33 per cent.

General application

Such an estimation is not confined to processing times. It can equally well be applied to processing rates and arrival rates, indeed, any function which has a similar distribution. The most important single application of this 'three time estimates' procedure is in the field of network analysis, specifically in the Programme Evaluation and Review Technique (PERT).

Management Bookshelf

The History of Office Work

Mrs B. M. Howard, Civil Service Department

In contrast to my last article, which mentioned some literature on the office of the future (*Management Services in Government*, August 1979), this review looks at the past, suggesting some books and journal articles of interest to those of a historical bent. But since, within the field of management services, there are so many classic texts and so many developments I have restricted myself to the history of office work and of office machines.

Any readers who are seeking information on the pioneers of management theory may care to examine the Pelican anthology *Management Thinkers* (Penguin Books; 1970; 363 pages; £1·25), which contains extracts from the writings of such masters as F. W. Taylor, the Gilbreths, Fayol, Follett, Mayo, *et al.* Those looking for a briefer historical review will find one in the journal *Management Services* (March 1976) under the title 'Work Organization', written by Paul Kember.

The office worker

Many of us spend a third of our waking hours in an office, yet how often do we try to imagine what life must have been like for our predecessors, bereft of telephones, typewriters, calculators or copying machines? We can gain some idea from Alan Dalgardo's book *The Enormous File: a social history of the office* (John Murray; 1979; 120 pages; £5·95), a fascinating overview of the changes that have taken place from the times of the Renaissance merchant to the era of the temp and the computer. Profusely illustrated with contemporary drawings and cartoons, it is a fascinating contribution to social history. As to life in the 19th-century Civil Service, readers of Anthony Trollope's *The Three Clerks* will recall his accounts of the work of the Internal Navigation Office and the reforms of Sir Charles Trevelyan, thinly disguised as Sir Gregory Hardlines.

In the 19th century the office was an exclusively male domain; today, by contrast, almost two-and-a-half million women are engaged in clerical work. A historical review of the manner of this change is given by Rosalie Silverstone in an article 'Office Work for Women' in the journal *Business History* (1976; pages 98–110). Females were first employed in the Civil Service in the Post Office, initially as telegraphists, but soon entrusted with clerical work. The idea of employing ladies

did not immediately commend itself to the Service generally, nor to parents who feared the dangers to which their daughters might be exposed in working with men.

It was the introduction of typewriters in the 1870s that speeded job creation for women, although there was at first some confusion about the correct nomenclature for the operatives: 'typist' was considered a most objectionable title; the correct appellation was thought to be 'type-writer copyist', but the ladies themselves were known as 'typewriters' until the turn of the century. Their working conditions in the then Board of Agriculture were depicted by Sir Francis Floud thus: 'The one woman typist was secluded in a dingy little room in the basement and the chief clerk issued an imperative order that no member of the staff over the age of fifteen was to enter her room' (*The Ministry of Agriculture and Fisheries*; published in 1927 by Putnam in the 'Whitehall Series').

Shorthand and typing

The use of typewriters was linked with the practice of shorthand from the mid-1880s, and in 1899 *The Queen: the Ladies' Newspaper* stated that for an amanuensis the twin skills are 'absolutely essential'. Shorthand itself has a long history: it was in use in Roman times; Julius Caesar wrote it, as did St Cyprian and St Augustine; but it was in Britain that the art as we know it today was cradled and nurtured from the times of Henry II. A history of stenography (or tachygraphy, or brachygraphy, as it has variously been called) is set out in a 20-page pamphlet issued by Pitman Publishing: *As Fast as Speech* (1977; £0·30).

Typewriters

The history of typewriters commenced in 1717 with the issue of a British patent granted to a Henry Mill for 'an artificial machine for the impressing or transcribing of letters singly or progressively . . .'. The handbook of the National Collection of Typewriters in the Science Museum in London, *The History and Development of Typewriters* (HMSO; 1964; 49 pages; £1·00), illustrates and describes many of the early models. Other histories are: *The Writing Machine*, by Michael Adler (Allen & Unwin; 1973; 381 pages), and *Century of the Typewriter*, by Wilfred Beeching (Heinemann; 1974; 276 pages; £4·50).

Office machinery

The introduction of the typewriter, allied to the invention of stencil duplicating, revolutionized the late 19th-century office. *The Origin of Stencil Duplicating*, by W. B. Proudfoot (Hutchinson; 1972; 128 pages; £2·00), traces the early history of mechanical copying—a story which is brought up to date by John Dessauer in his account of *My Years with Xerox: the billions nobody wanted* (Manor Books; 1976; $1·75). Among the histories of companies manufacturing office machines are: *The Roneo Story*, by J. S. Dorlay (1978; 223 pages; £4·95) and *The*

History of Pitney Bowes Limited, by S. T. Roberts (1975; 143 pages), both published by their sponsoring companies.

Computers

It is an interesting dichotomy that although computers are often seen as inhuman robots, most of the histories of the machine are not descriptions of electronic developments but biographies of their inventors. Jerry Robson christened these men *The Computer Prophets* (Macmillan; 1969; 192 pages) and begins his saga with Blaise Pascal whose calculator, built when he was but 20 years old in 1642, could perform addition and subtraction but not the non-linear operations of multiplication and division. Among the other men depicted are Thomas Watson, the founder of the IBM empire (whose full story is told by William Rogers in his volume entitled *Think*, issued in 1969 by Weidenfeld and Nicholson), and the Englishman Charles Babbage (1792–1871), who enunciated the principles on which all modern computing machines are based. Babbage's unlikely collaborator was Lord Byron's only legitimate daughter, Ada, whose amazing capabilities are described by Molly Glaister in an article headed 'Lady Lovelace and the Difference Engine', which appeared in *Computer Decisions* in May 1975, pages 38–41.

O and M and work study

There is no one person who can be credited with the invention of O and M, nor can any precise date be put to its beginning. In an article in *Office Management* (April 1961, pages 121–124, 129) entitled 'O and M in the Post Office', Mr N. O. Johnson drew attention to the work of postal surveyors in improving efficiency as early as the mid-19th century, but he acknowledged that, so far as clerical work was concerned, the Post Office was 'a year or so behind the Treasury'.

It was the Royal Commission on the Civil Service (the 'MacDonnell' Commission) who in 1914 recommended the creation within the Treasury of a special section among whose responsibilities was 'to carry out inquiries and investigations into any matters connected with departmental administration and methods of working'. But in evidence to the Commission, the then Permanent Secretary to the Treasury, Sir Robert Chalmers, insisted that a large body of information on office methods and organization already existed within his department.

A short 'History of O and M in the United Kingdom', drawing largely on Treasury sources and written by Lawrence H. Bunker of that department, appeared in the *O & M Bulletin* in August 1968. Another account of 'Some Developments in Organization and Methods since 1921', as described by Harry Ward, was published in *Office Management* (Autumn 1970, pages 123–128). That same journal also carried (in successive issues from January 1954) 'A Short History of the O.M.A.' by G. D. Gardner, one of the founders of the Office Management Association in 1932.

As far as work study is concerned, it is suggested that its father was not, as is commonly supposed, F. W. Taylor but Leonardo da Vinci: this idea was put forward by S. J. Noel-Brown, the then Treasurer of the Institute of Work Study Practitioners, in an article on 'The History of Work Study' in the December 1969 issue of *Work Study and Management Services*.

Conclusion

This article has touched only briefly on this topic. Should any of our readers wish to research the matter further, a reading list, 'The History of Office Work', is available without charge from the Central Management Library, Civil Service Department, Whitehall, London SW1A 2AZ.

MSIG under new management

John Green, editor of this journal and of its predecessor, the *O and M Bulletin*, since 1969, has moved to a new job elsewhere in the Civil Service Department. Under his care the scope both of the journal and its readership have increased by leaps and bounds but the quality of its contents and presentation has never faltered. Readers will, I am sure, wish to join his successor in wishing him well. For his part, John would like to thank all who have supported him, particularly those who have contributed articles to the journal.

The new editor (Leo Killeen) knows that he will do well if he builds on he sure foundations bequeathed to him. He would like to remind readers that he will always be willing to consider articles for publication on management topics and to receive correspondence.

New CSD Publications

This is a list of the documents recently issued by the Civil Service Department and its associated bodies. It includes material from the Central Computer Agency, the Civil Service College and the Civil Service Commission, as well as from CSD itself.

These items may be examined in the Central Management Library, Civil Service Department, Old Admiralty Building, Whitehall, London SW1A 2AZ.

Unless otherwise stated, requests for copies should be sent to the Central Management Library, CSD, at the above address. HMSO publications may be ordered from PO Box 569, London SE1 9NH; from Government Bookshops, or through any bookseller.

Civil Service Statistics 1979
60 pages; available from HMSO; price £2·75; ISBN 0 11 630347 6.
Civil Service Year Book
Abridged and updated edition mid-1979
144 pages; available from HMSO; price £2·50; ISBN 0 11 630422 7
Committee of Inquiry into Pay and Conditions of Non-Home Department Police Forces
Report. Cmnd 7623
72 pages; available from HMSO; price £2·25; ISBN 0 10 176230 5
Crown Proceedings Act 1947
List of authorized government departments and the names and addresses for service of the person who is, or is acting for the purposes of the Act as, solicitor for such departments
4 pages; available from HMSO; price £0·20; ISBN 0 11 630348 4
Guide to the Provisions for Increasing Public Service Pensions
8 pages; available from HMSO; price £0·10; ISBN 0 11 630423 5
Home Civil Service
Senior staff movements
2 pages; published monthly; gratis
Implications of Micro-electronics in Personnel Management
4 pages; Central Management Library reading list series A102; gratis
Job Satisfaction
A selection of articles from *Management Services in Government*
28 pages; price £1·15
Privacy and Security in Computer Systems
4 pages; Central Management Library reading list series A19; gratis
Review of the Framework for Government Research and Development
Cmnd 7499
58 pages; available from HMSO; price £1·25; ISBN 0 10 174990 5
Training in the Civil Service: a Chronological Survey

5 pages; Central Management Library bibliography series B27; gratis
Visual Display Units—Health Hazards
2 pages; Central Management Library reading list series A97; gratis

Central Computer Agency
The following items are available without charge from Mrs S. Ross, Central Computer Agency, Publications and Information Branch, Riverwalk House, 157–161 Millbank, London SW1P 4RT.
Hardware Cataloguing Conventions for ICL 2900 Series
4 pages
Microcomputer Newsletter
Issue No. 4, May 1979

Civil Service College
The annual report is available from The Secretariat, Civil Service College, Sunningdale Park, Ascot, Berks SL5 0QE. The working papers are available from The Librarian, at the same address.
Annual Report, September 1977–August 1978
64 pages; gratis
Departmental Planning Units
Summary of proceedings of a workshop held 21–23 February 1979
53 pages; CSC Working Paper No. 12; gratis
Parliament and Defence Affairs: a Critique of the Major Decisions Approach, by M. Hyder
23 pages; CSC Working Paper No. 11; gratis
Proposition 13 in California: the Background and the Effects, by G. Cohen
16 pages; CSC Working Paper No. 13; gratis
Positive Discrimination in Health, by S. Blume
21 pages; CSC Working Paper No. 14; gratis

Civil Service Commission
The following items are available without charge from Careers Information Division, Civil Service Commission, Alencon Link, Basingstoke, Hants RG21 1JB.
Accountants
Civil Service careers
24 pages
Civil Service Careers
Three posters for degree, GCE and SCE levels; gratis
Working in Science
Civil Service careers
4 pages

Letters to the Editor

The views expressed in Letters to the Editor are the writers' own, and not necessarily those of their departments.

Dear Sir,

Mr Croisdale ('Computer Work Revisited', August edition) deserves applause for reminding us of the essentiality of an independent view of the Total System within which a computer system lies. Even in those systems which could never function without a computer at their heart, someone, whom Mr Croisdale chooses to identify as a systems analyst, must be capable of visualizing the Total System, unencumbered by undue attention to computer constraints.

Mr Croisdale provides us with a useful model, showing computer-system people on the one hand and host-system people on the other, and to make his point more telling emphasizes the dissimilarity between the talents which each must display. However, if the majority of systems analysts of the future are to spring from the ranks of the users, by way of O and M, an awareness of the capabilities and limitations of computers must be high on the agenda for their early training. Likewise, the minority of systems analysts broadening their horizons from a background within computing must be prepared to relearn the art of really listening to the user when the latter relates his problems at interview. Thus, the resultant being, though he resides among the host-system people, needs not only an awareness of the breadth in work study, accounting, behavioural science and business studies among those things that Mr Croisdale mentions, but an awareness of the computer as well. Total-systems analysis needs all the information.

I trained as a computer-systems analyst (Mr Croisdale was, happily, among my early tutors) and spent several profitable years within computing. Gradually, however, I became aware that the situation within a Computer Services division predisposed one towards a computer solution to every problem encountered. I came to the conclusion that the only way to be a properly objective problem-solver was to cross the bridge into Management Services, a course I have successfully taken. Adding my experience to the argument for the computer-system/host-system model Mr Croisdale provides, I conclude that the boundary between Management Services and Computer Services in government departments should move over. If the Management Services Manager assumes responsibility for the Total System and the Host System we shall have placed the computer in its true perspective as a very sophisticated tool—but only a tool—of management.

Yours sincerely,

R. B. BARNARD
Management Development Division
Civil Service Department

Computer Installations for Government Departments

A list of all Government computers as at 1st January 1979 was published as a supplement to the May 1979 edition. Details of computers ordered during the period 1st April to 30th June 1979 are shown in the following table.

DATE OF ORDER	DEPARTMENT[1]	LOCATION	MAIN USES	MANUFACTURER[2] AND TYPE OF COMPUTER
1B Computers on order for administrative and general purposes				
April 1979	MOD (Navy)	Ensleigh	Cost modelling	HP 9845S
2B Computers on order for scientific and technical purposes				
April 1979	MOD (PE)	Farnborough	Graphics work	Tektronix 4014-1
April 1979	MOD (PE)	Farnborough	Network testing	DEC PDP 11/60
June 1979	MOD (Navy)	Fleetlands	Finite element analysis	DEC PDP 11/60
June 1979	MOD (Air)	Bracknell	Processing of satellite data images	DEC PDP 11/60

[1], [2] Refer to supplement to May edition for Department and Manufacturer keys.

MISSING PAGES ARE INDEX PAGES
WHICH HAVE BEEN PHOTOGRAPHED
AT THE BEGINNING OF THE VOLUME(S)